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CERTIFICATE OF TRANSLATION - AFFIDAVIT OF ACCURACY

I, the undersigned, being duly sworn, depose and state:

The attached translation, German Patent Application, is an accurate, true and complete rendition into the English language from its original German text, and nothing has been added thereto or omitted therefrom, to the best of my knowledge and belief.

Signature

Emily Swartz
Print Name

Sworn to and subscribed before me

this 21st day of July, 2006.

Elizabeth S Barlow
Notary Public

ELIZABETH S. BARLOW
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No. 01BA6129918
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Commission Expires July 05, 2009

DESCRIPTION

Deformable Illumination Module

The invention relates to a deformable illumination module with a plurality of circuit boards that have at least one optical emitter arranged thereon, respectively, and that are connected to form a chain via electrical power supply wires. The invention relates in particular to illumination modules for back-lighting light-permeable materials such as e.g. acryl in luminous letters.

Known illumination modules of this kind, such as e.g. the Tetra® LED system by GELCore or the LED hose by Hansen-neon, do not allow for changing the distances from one light-emitting diode component part to another light diode component part; they are therefore not scalable in terms of their luminance and, depending on the radiation characteristics with regard to a luminance that is as homogenous as possible, only usable for a very limited magnitude range of luminous letters. Moreover, the maximum length of these illumination modules is very limited.

It is the object of the present invention to provide an illumination module of the kind as set forth in the introduction that allows for easy varying of the luminance whereby longer chains are possible than to date.

This object is achieved with an illumination module that has the characteristics as stated in claim 1. Advantageous improvements of the illumination module are outlined in the dependent claims.

A plurality of circuit boards is envisioned for an illumination module according to the invention,

and arranged on the circuit boards is respectively at least one optical emitter, in particular a light-emitting diode component part, and the circuit boards are connected via two massive electrical power supply wires to form a chain. The electrical power supply wires run without interruption across all circuit boards of the chain. The circuit boards of the chain are connected in parallel with regard to each other by way of these power supply wires.

Covered by the term "without interruption" are all configurations that have the power supply wires severed on the circuit board but that are continually electrically connected on the circuit board without essential reduction of the cross-section.

Aside from the at least one emitter, it is possible to arrange on each circuit board additionally at least one further electronic component that is electrically connected to the optical emitter.

A preferred embodied example provides that for the purpose of reinforcing the connection between two respective circuit boards the electrical power supply wires are connected into a bundle between the circuit boards, for example by crimping.

In a special embodied example the circuit boards are grouped into a plurality of circuit board pairs and the optical emitters of each circuit board pair are connected between the two circuit boards by way of a connecting wire.

Light-emitting diode component parts are particularly preferred optical emitters.

The power supply wires between respectively two circuit boards run preferably in a meandering fashion. This allows, on the one hand, for varying the distance between two circuit boards and, on the other hand, the bending radius of the chain can be changed easily.

It is particularly preferred for the circuit boards to be tapered in the direction of the their ends that are pointing toward each other and for the power supply wires to run together, starting from a widened middle part, along the edges of the circuit boards. The circuit boards are preferably configured as rhomboid in shape or as a flat-pressed hexagon or octagon having their long axes arranged along the main direction of extension of the chain.

Usable as circuit boards are both printed circuit boards (PCB's) as well as metallic lead frames that have the optical emitters and, if need be, the associated electronic component parts arranged thereon. In addition, it is possible to manufacture circuit boards with MID technology, including e.g. hot pressing.

A special advantage of the illumination module according to the invention lies in the fact that, without having to change production, it can easily be adjusted for special customer wishes. The meandering form of the power supply cable bundle between the circuit boards allows for extensive variations of the distance between the circuit boards and thereby also for variation of the length of one and the same illumination module.

An illumination module according to the invention can advantageously be manufactured easily via a reel-to-reel process

whereby power supply lines that are available in "infinite" form are stripped at certain intervals, and the circuit boards are connected at these location to the otherwise continuous power supply lines and then connected to the latter.

In a particularly preferred embodied example the power supply lines run only on the front side of the circuit boards which is also where the optical emitters are located. The circuit boards can then advantageously feature a flat back side thereby allowing, for example, for the technically simple and direct fastening by way of a screw through a bore hole that is envisioned for this purpose or by way of double-sided adhesive tape.

Further advantages, improvements and advantageous embodied examples become clear based on the embodiment that is explained based on the figure.

The figure shows a schematic depiction of a top view of the embodiment.

The figure is, as a matter of principle, not to be understood as true to scale. Also, individual component parts are, as a matter of principle, not depicted as representing their actual size-specific dimensions relative to each other.

The embodiment features a plurality of circuit boards 1. Arranged on said circuit boards 1 are two light-emitting diode component parts 2, respectively, as optical emitters which are connected by way of two electrical power supply wires 3, 4 to form a chain. The electrical power supply wires 3, 4 are brought across all circuit boards 1 without interruption creating a parallel connection of the circuit boards 1 of the chain.

Aside from the light-emitting diode component parts 2, the circuit boards 1 have arranged on them further electronic component parts 5, respectively, that are electrically connected to light-emitting diode component 2.

Electrical power supply wires 3, 4 are combined into bundles, respectively, and crimped to reinforce the connection between two respective circuit boards 1. In the alternative, it is also possible to use a flat cable that separates in the area of the circuit boards.

In an embodied example in which the light-emitting diode component parts are connected by respectively two circuit boards that are adjacent to each other, the latter is achieved by way of a further connecting wire between the two circuit boards.

The power supply wires 3, 4 between two given circuit boards 1 run in a meandering fashion.

In the direction of the extension of the chain, circuit boards 1 have the shape of an elongated octagon, and the power supply wires 3, 4 run together along the edges of the circuit boards, starting at the widened middle part. In particular, they do not have back-side contacts which means that, during the installation of an illumination module, it is not necessary to take special steps to prevent, for example, a short.

The circuit boards have e.g. a flat back side whereby, for example, direct fastening by

way of a screw through a bore hole envisioned for that purpose or by way of double-sided adhesive tape is possible.

The illumination module can advantageously be manufactured by way of a reel-to-reel process whereby power supply lines that are available in "infinite" form are stripped at certain intervals. At these stripped locations circuit boards 1 are connected to the otherwise continuous power supply lines and connected to the latter.

The illumination module can optionally have secondary beam-forming optics, for example in the form of detachably (e.g. via a plug-and-socket device or a clamping connection) or non-detachably (e.g. using glue) fastened collecting or diverging lenses and/or diffractive optics (not shown in the figures). This allows for adjusting the luminance and/or the homogeneity of the luminance of the illumination module by changing the radiation characteristics of light-emitting diode component 2.

The description of the invention by way of the embodiment shall naturally not be seen as a limitation of the invention to this embodiment alone. The characteristics of the invention that are disclosed in the present description, in the drawing and in the claims can have essential significance either individually or in any combination for the implementation of the invention.